



A FUTURE-PROOF BUILT ENVIRONMENT

Putting circular business models into practice

 **CIRCLE**
ECONOMY



ABN·AMRO



"Circl fits in perfectly with ABN AMRO's sustainability ambition, referred to as Mission 2030. We are fully committed to making our real estate portfolio more sustainable: all homes and offices financed by the bank should have an average of energy label A by 2030. By applying and facilitating circular business models, we want to make an even bigger contribution to a future-proof society."

Kees van Dijkhuizen, CEO of ABN AMRO



"As the co-author and architect of the Cradle to Cradle concept, I am delighted to see designs for a circular economy – which seemed so radical when we put them forward twenty-five years ago – becoming so enthusiastically embraced and replicated. Our central concepts such as "buildings like trees", safe products such as biological and technical nutrition, products as services, design for disassembly and buildings as material banks are being studied and adopted enthusiastically, but nowhere better than here and now in the Netherlands. Thank you and congratulations."

William McDonough, Founder/Architect William McDonough + Partners,
Inaugural chair of the World Economic Forum's Meta-Council on the Circular Economy



"The reuse of building materials with the aid of new (digital) technology fits in well with BAM's strategy in which innovation and sustainability are key drivers. The partnership between ABN AMRO, BAM and the other partners involved in the construction of the Circl pavilion shows that a 'coalition of the willing' can increase the feasibility of circular business models. We are looking forward to partnerships that can help us take the lead in the development of new business models."

Rob van Wingerden, CEO of BAM



"Construction and Real Estate are among the sectors that make most intensive use of raw materials. There must be a change in how raw materials are used in architecture, construction, operation and demolition. This will only be possible with a different mindset throughout the sector: a circular-economy approach as the guiding principle for the entire construction industry!"

Pi de Bruin, Partner of de Architecten Cie.



"Circular construction will become the new standard for the construction industry as a way of preventing the depletion of raw materials and adverse effects on the living environment; this requires a revolutionary approach in the sector."

Bernard Wientjes, Chair of the Construction Agenda Taskforce



"To make progress on climate change, we have to make sure we don't take out more than we can put back. The principles of the circular economy fit in perfectly with this."

Annemarie van Doorn, Director of the Dutch Green Building Council



"We develop real estate based on the philosophy that our buildings and raw materials are entering into a long-term relationship. A building brings together creativity, money, energy and raw materials. The longer those aspects in combination can form a building, the less is lost (or in other words, the more sustainable it is). For instance, we are now developing HAUT, the tallest wooden residential building in the Netherlands, a meaningful and flexible structure. Wood is not only a good circular input, it is also a much more appealing product that offers many possibilities."

Bob Jansen, CEO of Lingotto



"In this report, we and our partner ABN AMRO are showing that circular construction is past the start-up phase. Businesses and cities now need practical, scalable solutions so that the built environment can be developed or redeveloped in a future-proof manner. We develop these solutions together with our partners in the international Circle Built Environment programme."

Harald Friedl, CEO of Circle Economy

BETTER TO BEND THAN BREAK!

The construction industry is bursting with ambition, but it is also seen as inflexible. 'The Construction Industry makes it' is the Dutch sector's slogan. That is true, but are we also making dreams about the circular economy come true? In ABN AMRO's cross-sectoral report on the circular economy (Alles van Waarde, June 2017), the section on the Construction & Real Estate sector was entitled 'Tomorrow starts today'. In other words, thinking about the future implies acting now. We need to get a move on with the transition to the circular economy. Which means we need to bend before we break.

Sustainable and circular

The circular economy goes further than just making things more sustainable. Improving sustainability often mainly involves reducing energy consumption, whereas the focus in the circular economy is on raw materials. The Construction & Real Estate sector stands out as a heavy user of raw materials. Viewed from this perspective, we are standing on top of an enormous raw materials bank. From this position, we can make tangible contributions to a more circular economy.

In case you didn't know - we're running out of time!

The Dutch government aims to use 50 per cent less primary raw materials by 2030. That is a tough target for the sector. Imagine that in 12 years' time or so, a construction project will have to be designed and built in such a way that the materials and construction elements can be reused in a straightforward manner. What is more, at least half of the structure will have to consist of reusable raw materials or biomass. To achieve this, a lot needs to be done - an awful lot.

Clear-cut objectives

We have formulated some clear-cut objectives to help speed up the transition to a circular economy. These are not just words - we are taking action too. Thus, ABN AMRO is initiating and implementing specific projects. Circl is the most tangible of these for our sector. This pavilion in the Zuidas, with its optimum implementation of circular principles, is the result of a partnership we are proud of.

Circl as a recurring green theme

The brand-new ABN pavilion provides a recurring 'green theme' throughout this publication. As in Circl itself, we are doing this to put into practice the different business models that enable a circular economy. In this report, we also show the extent of the potential market for circular construction.

Invitation: come to Circl

This report envisions a future-proof Construction & Real Estate sector through circular business models. This is a complex and wide-ranging subject and there is much more to say about it. We would be happy to do just that, preferably at an appropriate venue where there is much to experience, namely Circl. ABN AMRO is building properties, sharing its expertise and setting serious objectives - with appropriate funding. If you are a businessperson who wants to innovate, partner with others and close the loop, then we invite you to our new circular pavilion to join us to start bending the industry before it breaks.



Petran van Heel

Sector Banker, Construction &
Real Estate, ABN AMRO

SUMMARY

The circular revolution in the Construction & Real Estate sector has started. Being the largest consumer of raw materials worldwide, it is high time for the sector to reform. In this publication, we share what we have learned as ABN AMRO, using examples from our circular pavilion in the Zuidas district of Amsterdam (Circl). We show what opportunities and business models there are for entrepreneurs in the construction industry. As doing nothing is no longer an option, we prefer a 'right to copy' rather than 'copyright'. The transition to a circular economy must be accelerated.

The Dutch Government has the ambition to be 50% circular by 2030, and fully circular by 2050. Based on these objectives, we set out the potential market for the five circular business models that we use as a bank, here at ABN AMRO. The current construction industry must bend, slowly but surely, to get all the subsectors on board and close the loop. We see new opportunities for all subsectors in the resulting 'construction circle'. Existing players will have to find a new position in that circle (suppliers will become service providers, demolition businesses will become suppliers), while new players will help accelerate the transition to a circular economy. These could be start-ups using 3D printing technology or digitally driven sharing platforms. The transition to a circular economy requires a new mindset from all parties and new forms of far-reaching cooperation. Current practice has proved difficult to change, but the lessons and creative solutions in Circl, and elsewhere, show that it is possible. We can do it together!

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1. INTRODUCTION

The Netherlands has one of the highest population densities in the world. We have built a lot of properties to house these people and extensive infrastructure to transport them. And we have not finished yet. Following the global economic crisis, the construction industry is once again an important engine of economic growth, but it is also one of the biggest consumers of raw materials and energy. Smarter and more efficient management of raw materials is, therefore, crucial to enable lasting prosperity.

This report identifies specific possibilities for the application of circular business models in the Construction & Real Estate sector. We also explain the opportunities that this creates for businesses. In building Circl - our circular pavilion -, ABN AMRO has acquired practical experience of what circular construction involves. We now know what opportunities it offers, and how much creativity is on offer, and how many solutions there already are. However, we also know where current practices are resistant to change. This publication is our invitation for you to explore with us how circular construction can become the new norm.

The start of a worldwide revolution

Innovation is taking place throughout the Construction & Real Estate sector, from digitisation, industrialisation, greater use of robots and 3D printing, to sustainability improvements. Current construction practices are no longer future-proof (see insert). International organisations are embracing the promise of the circular economy - a fundamentally different approach to the organisation of our economic system - and its potential for the construction industry.¹²³⁴ As a result, increasing numbers of companies in the Construction & Real Estate sector are becoming involved in this movement.

Construction industry is a heavy user

The Dutch construction industry is a heavy user of raw materials: the sector consumes 250 million tonnes, making it responsible for about half the total consumption of raw materials in the Netherlands. Every year, it produces 23 million tons of demolition waste, of which 97 per cent is recycled. Most is turned into rubble for use under road surfaces. What is more, the sector is responsible for 40 per cent of Dutch CO₂ emissions.

The Netherlands leads the way in the circular economy

With the aim of achieving significant material savings, the Dutch Government has established the government-wide programme Nederland Circulair in 2050 ('a circular economy in the Netherlands by

Current building practices are not future-proof



The construction industry is far and away the biggest user of raw materials worldwide: almost half of what is extracted every year (41 billion tons) is used by this sector (mainly minerals and ores).*



The impact on people and the environment is huge. The construction industry is responsible for a quarter of global CO₂ emissions.⁵



Demand for raw materials in general⁶ and building materials in particular⁷ is increasing, mainly because of urbanisation and the growth of megacities in countries such as China and India^{8 9}



Materials are becoming scarcer and prices more volatile. As a major consumer for infrastructure projects, China is now determining the price of metals¹⁰ and some rare earth minerals¹¹ on the global market.



Current building practices mean that those materials are inevitably 'gone for good'. Linear designs and material use in buildings mean that downcycling, incineration and dumping are the only options after demolition.

* Analysis by Circle Economy based on Exiobase (2011); Tukker et al., EXIOPOL - Development and illustrative analyses of a detailed global MR EE SUT/IOT (2013) Economic Systems Research, 25 (1), pp. 50-70.; Wood et al., Global sustainability accounting - developing EXIOBASE for multi-regional footprint analysis (2015) Sustainability (Switzerland), 7 (1), pp. 138-163

2050'). A number of sectors, including the construction industry, must become at least 50 per cent circular by 2030. With these goals, the Netherlands is setting the tone internationally. To achieve this ambition, the Government presented the National Raw Materials Agreement at the start of 2017. This agreement has now been signed by more than 250 parties, including a large number of companies in the construction industry.¹²

Within the construction sector, the government-wide programme is focusing on renewable materials, the optimum use of materials throughout the lifetime and a reduction in CO₂ emissions during construction and operation. The first steps are becoming increasingly specific: the Concrete Agreement is close to implementation.¹³

ABN AMRO identifies – and seizes – opportunities with businesses and society

In our 2014 report *Circulaire bouwen: het fundament onder een vernieuwde sector*¹⁴ ('Circular construction: the foundation for an innovative sector'), we have already spoken about the necessity and opportunities for circular construction. Since then, ABN AMRO has joined forces with market players to learn together how we can flesh out circular business models for the construction industry. The most tangible result of these collaborations is the circular pavilion in Amsterdam, Circl.¹⁵

The pavilion goes as far as is currently feasible, but we are not finished yet. Circl is a living laboratory in which we can explore what is possible at present in the field of the circular economy and what could be possible in the future, drawing on new experiences from the Netherlands and abroad. Thus, Circl is not the final destination, but a starting point for the transition we have begun with our private and public partners.

Circular business models in practice

This report is a deepening of the broader sector publication *Alles van waarde* ('Everything of Value'), and its chapter on the Construction & Real Estate sector that was published this year.¹⁶ The knowledge and experience that we at ABN AMRO acquired in the creation of Circl forms a 'green theme' that runs throughout this report. We would like to share our own specific examples with you. In Chapter 2, we present which circular business models have been implemented, but also what other possibilities there are. We consider the financial challenges for companies in each business model. In Chapter 3, we go through the opportunities for individual stakeholders, from raw material suppliers and architects, to investors and demolition businesses. In Chapter 4, we assess the potential market for each of the business models.



2. FIVE CIRCULAR-ECONOMY BUSINESS MODELS IN THE SECTOR

The circular economy offers practical opportunities for a transition to a waste-free, resilient economic system. New business models make this possible. The essence of the circular philosophy is the need to move from a linear 'take-make-waste' economy, to a circular economy. In this approach, products will last longer, we will use materials in a never-ending cycle and we will get the most out of existing assets such as buildings and machinery.

ABN AMRO uses five circular business models: ¹⁷



Circular business models



CIRCULAR INPUTS

Use non-toxic, high-grade recycled, bio-based or biodegradable raw materials that are renewable or can be reused. Reduce the use of raw materials in general.



PRODUCT-SERVICE SYSTEMS

Deliver a service instead of a product and retain ownership. Monitor and stay in control of raw materials. Relieve clients of the burden and ensure their long-term loyalty.



LIFETIME EXTENSION

Maintain and extend lifetime through the use of smart maintenance, repairs, upgrades and renovation.



SHARING PLATFORMS

Combat underutilisation or surplus capacity by sharing products or assets and optimising their use.



VALUE RECOVERY

Use waste from used products and the production process to make new raw materials.

There are three important enabling factors in the circular economy that can make these business models possible: ¹⁸



DESIGN FOR THE FUTURE

Design building materials – from components to complete buildings – and services for efficient maintenance, repairs, dismantling, upgrades, renovation, adaptation ¹⁹, transformation and high-value recycling. Use modular design principles and prefab elements that facilitate disassembly.



USE DIGITAL TECHNOLOGY

Use digital technology, ²⁰ such as BIM, the Internet of Things (IoT) ²¹ and blockchains ²² to store, trace and monitor Big Data on materials, products and transactions. Make use of 3D printing, drones ²³ and additive manufacturing.



COLLABORATE ON VALUE CREATION

Enter into a dialogue with partners in the sector and beyond. This will bring you new value propositions based on trust, transparency and performance. Create social and ecological value as well as financial value. For example, consider using a Circular Economy Service Company (CESCo). ²⁴

In the pages that follow, we will go into more detail on specific examples from the Construction & Real Estate sector, including Circl. We will also discuss the challenges associated with each of these business models.

In circular construction, raw and other materials and products are used that deliver value before, during and after use. ²⁵ Raw materials are only used where unavoidable and provided that they are renewable (wood, hemp, flax, etc.). ²⁶ They originate in natural cycles, or come from the direct reuse of complete construction elements or from high-value recycling of materials such as metals and concrete. The use of toxic substances and non-recyclable materials is avoided. Furthermore, in the design phase, attention is paid to how materials can benefit the living environment in and around a building and how they can have a positive impact on the indoor climate. As a result, health and labour productivity among employees is improved, and energy consumption lowered.

The added value from this circular approach is obtained when knowledge is used at the start of the process that concerns the operational phase and the end-of-use phase. This closes the loop. Such an approach applies to both designers and architects on the one hand and developers, builders and building managers on the other. ²⁷ Demolition and recycling businesses also have to change their perspective; rather than representing a modest residual value, buildings now become rich raw-material banks. Recycling businesses become raw-material suppliers and construction consultants, while traders in building materials become sector coordinators.

Digital technology and tools help store information about the materials that have been used, for example by linking material passports ²⁸ to BIM. IoT and blockchain solutions will make it possible to track raw materials and product performance and therefore to obtain a comprehensive picture of the life-cycle costs.

Financial solutions

Banks are track-record-driven and therefore often look at proven businesses. Even so, the financing for this business model does not differ much from banks' current approach to financing businesses and innovations. A sound estimate of the costs and revenues and certainty concerning sales are important. One solution for supporting new circular-economy developments could be to have separate funds with a different risk acceptance.

New value

- New regulations – which can be expected in the years ahead – are already being factored in
- Contribution to the reduction of the waste problem and consequently the route to a fully circular economy
- The possibility for both suppliers and clients to have a better view of return streams and residual values

Challenges

- Innovation for the development of renewable raw materials requires investment
- Competition with existing or alternative raw materials/products
- Availability and volume of feedstock; the market still has to be developed and supply and demand have to be matched
- Uncertainty concerning product specifications, performance and acceptance by customers
- Legislation and regulations that still stand in the way of the reuse of waste as new raw materials, for example
- Dependency on sector partners



Michel Baars
Managing Director
New Horizon

“It is no more expensive and does not take any longer. But it is much more fun and also more sustainable and more in line with a circular economy”

Harvesting value from other properties

ABN AMRO deliberately opted for circular inputs. The walls in the basement of Circl that New Horizon supplied were made from window frames from an old Philips building. The 1,600 m² parquet floor is made from residual wood from various renovation, transformation and demolition projects.

Michel: ‘We create value by saving on processing costs and by reintroducing products from donor buildings into the market, as good as new. A major challenge here is matching supply to demand. If you do that properly, materials can be “harvested” immediately, without storage costs, and reused. Large volumes guarantee continuity. I see opportunities for the future in taking options on raw materials.’

New Horizon’s approach requires a different form of collaboration. ‘Absolutely. We will have to relearn how to do that in the circular economy. Trust and taking an integrated approach are key factors. We need to get away from agreeing and defining everything in advance in contracts. Leave the risks with the party that is best able to bear them and create new opportunities.’

‘The secret of success lies not just in the technical details, but also in the process. Which means in people. Circular construction requires creativity and collaboration, not just in the traditional building trade but across sectors. You innovate from the outside, by selecting the right people. As a company, you have to show clearly that you are embracing the circular economy and building for a better world; that can really persuade some young people. So be willing to experiment.’



More CIRCL examples of circular inputs

- The plastered walls and the felt on the stands contain old work clothing ([Denimtex](#))
- The insulating material in the ceilings is made from 16,000 old pairs of jeans ([VRK Acoustics](#) / [Metisse](#))
- New Horizon provided the second-hand fire hose reel cabinets ([KLING brandbeveiliging](#))
- Wall finishing made of residual wood ([Studio RAP](#))
- The interior has been designed to maximise the circular aspects ([DoepelStrijkers](#))
- The floor has C2C certification ([Tarkett iQ One](#))
- The ventilation ducts have been finished with sustainable textiles ([KE Fibertext](#))
- Renewable energy comes from solar panels ([Exasun](#))²⁹ and from an experimental Fasolar solar boiler ([De Groot & Visser](#))
- To minimise energy loss, direct current (DC) is used almost throughout for the lighting ([Fagerhult](#)) and other equipment – which is unique in the Netherlands
- Parking-lot heat regeneration
- The exterior wall ([De Groot & Visser](#)) is remountable and covered with C2C-certified plant modules ([Donkergroen](#))
- The roof garden and grounds garden have water storage and permanent plants ([Donkergroen](#))
- The restaurant ([Vermaat](#)) buys local, seasonal ingredients

Circular inputs outside CIRCL

- Bricks and building blocks of recycled materials ([Stonecycle](#), [ByFusion](#))
- Tiles made from recycled raw materials ([Mosa](#), [Enviromate](#))
- Bamboo wall panels ([BamCore](#))
- Wooden skyscrapers ([HAUT](#))
- Bitumen-free roofing ([Derbipure](#))
- Pipes made from 100% recycled HPDE ([The Green Pipe](#))
- Paint based on linseed oil ([Solvent Free Paint](#))
- Modular carpet made from recycled fishing nets ([Interface](#))
- Insulation made from recycled cotton ([Inno-Therm](#))
- Wall panels made from recycled raw materials ([Ecor](#))



PRODUCT-SERVICE SYSTEMS

The Construction & Real Estate sector is already experimenting a great deal with product-service systems³⁰, in particular for high-tech products such as lights, lifts and photocopiers, but also for carpets, inventory and even entire buildings. This trend can also be seen in other sectors, such as the automotive³¹, ICT and textile industries.³² The fact that the producer remains the owner of the product encourages that company to design the product in such a way that it is easy to repair and has a maximum residual value. The result is that optimum use is made of products, components and raw materials, and users are better served.

A producer can offer a product with a few or many services, up to the point where the producer retains full ownership.³³ The consequence is variable risk with varying opportunities for profit. In the simplest and most common case, a company (for example, a gas, plumbing or electrical business) offers extensive services to go with the product it has sold. The producer may also offer business services to ease the financial burdens on the client. An example is lease contracts that provide more control over the product. A final option is an integrated package of services in which the physical product is not actually sold at all. Take models such as pay-per-use or pay-per-output/performance, for instance. The producer then takes the product back for reuse at the end of the contract period.

Financial solutions

Companies offering product-service systems are increasingly obtaining finance and this is becoming more straightforward. Lease constructions or principles originating in project financing are used. Supply chain responsibilities and liabilities are shifted and laid down for the long term in contracts. Funding often takes the form of joint ventures, such as Special Purpose Vehicles. That means there is one party that manages all the risks and cash flows. Life-cycle costing methods are used to give a good picture of these risks and cash flows. Important preconditions for financing are scalability and – in particular for smaller parties – sound clients with long-term (lease) contracts.

New value

- Predictable cash flow due to constant flow of lease payments (income at regular intervals)
- Long-term relationship with the client
- Smarter use of the product due to better designs, maintenance and reuse
- More information on the materials and the product because the product returns to the producer
- Tailored contracts with options for termination after a certain period and based on clear arrangements and Service Level Agreements; all the parties involved draw up shared standard documentation

Challenges

- Growing balance sheet as assets are no longer sold
- Requires relatively substantial pre-financing
- Customers have to be financially sound to finance the supplier
- Dependency on sector partners
- Relatively long financing periods, sometimes up to thirty years
- Valuation of the residual stream because the product is returned to the producer, depending on the extent of its usage
- Often requires customised contracts
- Replicability and scalability are crucial



Ronald Koedam
New Installations Sales
Manager, Mitsubishi
Elevator Europe

“In this business model, we focus on maximising quality. The cost aspect then becomes of secondary importance.”

Vertical mobility as a service

ABN AMRO owns Circl, but it does not own everything in the building. The lift, for instance, is owned by Mitsubishi. This means the lift supplier is selling a service – vertical mobility – rather than a product. Ronald: ‘We provide the lift design and maintenance, and are paid for the proper operation of the lift based on a pay-per-use model. We call that M-use®. Clients get a discount on the annual costs if they use less than was agreed in the contract.’

It is in the interest of the manufacturer to have an optimally functioning lift because service failures reduce its income. At the end of the contract period, Mitsubishi can easily disassemble the equipment and reuse it. Alternatively, the client can take over the lift for an agreed sum. The value at the end is adjusted to take account of the material passport and the current value of the raw materials when the equipment is reclaimed.

Mitsubishi is breaking with the traditional vertical construction column with its M-use® concept. Whereas the traditional model focuses on building costs and the short term, Mitsubishi emphasises life-cycle costing and value creation in the long term. While the long service life reduces the asset turnover ratio, this business model lets companies with high-quality products compete with traditional, cheaper products of lower quality. That is the essence of the change.

Ronald: ‘We supply a high-quality product with smart sensors in the equipment; this lets us measure performance throughout the lifetime. The result is a dynamic and predictive maintenance schedule. Analyses of the performance data enable targeted product innovations and modifications. In short, the advantages are:

- process optimisation and (even) lower asset turnover thanks to intelligent equipment
- more efficient use of labour, materials and energy, and optimum costs for all the parties
- certainty in the long term; maximum availability, low incidence of service failures

A traditional lift lasts for twenty years. Mitsubishi guarantees a utilisation contract for double that: forty years.

‘In addition to recognition, our main challenges in setting up this business model have been the legal aspects. After all, ownership, building rights and risks are transferred from the client to the supplier. This requires new insights into new solutions and contracts.’



More CIRCL example of product-service systems

We can only give a few examples of product-service systems in our pavilion. There are various experiments ongoing, but not everything is ready for the market. In addition to lifts, we also buy in services for the audiovisual equipment. We have drawn up a pay-per-use contract, which we are now testing. We also have some items of (vintage) furniture from *Mass Modern* in the form of a service. In return, Circl serves as a storage area and showroom.

Product-service systems outside CIRCL

- Water as a service (M.J. Oomen)
- Climate systems (under development, *Eneco & Delta Development*)
- Light (*Philips, Ledlease, Lunera*)
- Facades (*TU Delft*)
- Carpet tiles (*Desso, Interface*)
- Washing machines (*Bundles*)
- Solar panels (*Sunpower*)
- Building-as-a-service (*The Dutch Mountains*)
- Real estate (*Twynstra Gudde*)

Extending the lifetime of a product seems contradictory for a production company, as it appears to reduce revenue in the short-term; the sales figures fall because you are selling fewer new products. Many companies focus primarily on the cost-oriented demand side. However, strategies to extend the lifetime – or rather the service life – can create additional value in the long-term.

Repairs, risk shifting, maintenance costs and energy costs play an important role in an integrated long-term view. The owner and the user, as well as the supplier, can save costs by improving monitoring using IoT and Big Data ³⁴, and by planning maintenance in a smart way (predictive maintenance). Artificial intelligence can bring even further optimisation in future. ³⁵

The service life of products such as electronics and furniture ³⁶ increases with refurbishment and remanufacturing. This gives the client a cost advantage as well as a better product, whereas the supplier can learn more about the phase in which the product is in use. The supplier also remains in contact with the customer and the product for a longer period by performing upgrades – especially if these upgrades are part of a product-service system.

Extending the service life of a building requires a sound request from the client in the first place. A good design that takes account of alternative functions, combined with timeless architecture, is also very important. Existing buildings must be restored, renovated or transformed where possible.

The building design should therefore factor in the life cycle, in part from a cost perspective. Some relevant design principles are modularity, detachability, standardisation (of dimensions and materials), adaptability ³⁷ and the 'LEGOisation' ³⁸ of components such as climate systems ³⁹ and buildings as a whole. Life-cycle costing ⁴⁰, the integrated calculation of construction, operational and environmental costs are indispensable for making the proper design choices. The challenge lies in determining which party can assess and make use of the additional value at what point.

Financial solutions

Extending lifetime by means of repairs, upgrades, revisions or remanufacturing assumes the investment will be earned back because the product lasts longer. In this situation, construction costs are secondary to the total cash flows over the economic life of the investment, and to any residual value of the materials. The emphasis rests firmly on the payback period for the investment. Companies that extend the lifetime of products can benefit from financing that is based on the above-

mentioned principles. This is comparable to improving the sustainability of real estate, which is also about extending the life of a building. That investment can be financed in full by ABN AMRO.

The concept of 'value' goes beyond financing alone. What is more, cost items can change into cash flows, for example, if you start to see waste materials as raw materials for new products. This introduces greater nuance and complexity in circular business models. Residual products that did not have any value at all can actually become valuable in a circular economy. But what does this value consist of, and who is going to guarantee it? A contractual framework that recognises and includes lifetime extension is therefore an important precondition for optimum financing.

New value

- Maintenance provides opportunities to minimise costs. Thanks to data collection, more and more is known about the properties of the materials and the products, and about how users handle the products.
- Refurbishment and remanufacturing let a manufacturer improve and upgrade products based on information about their use and performance.
- If buildings are constructed flexibly and adaptively to simplify maintenance, renovation or a change of function, this will benefit the financing.

Challenges

- Longer term for financing means more uncertainty
- Because of a lack of data, determining the residual value is still a challenge for accountants and financiers as well as businesspeople
- Return logistics: having products returned for refurbishment or remanufacturing
- Innovation is a barrier for some manufacturers
- The right incentive for companies to extend lifetimes and continue making money



Marcel Gouw
Director, Global-E-
systems Europe BV

“From a societal point of view, perhaps the largest gains are to be made by using a lot less energy to deliver the same level of comfort.”

Thermal batteries that last ‘forever’

GAIA PCM (Phase Changing Materials) panels are used for heating and cooling in the floors and ceilings of Circl. GAIA PCM is a thermal battery that lets you actively regulate hot and cold energy. PCM panels are fitted in a dry construction system with pre-formed floor plates and floor heating. The ceilings have PCM mats and an air treatment system to charge the thermal battery. All PCM panels are made of natural materials and therefore sustainable and fully biodegradable.

Marcel: ‘Acoustic insulation is achieved from top to bottom using:

- recycled jeans
- floorboards of laminated wood
- PE film with a layer of sand
- old pavement slabs
- coconut panels
- floor heating tubes in XPS panels
- heat-conducting aluminium panels
- PCM20 panels
- reinforced aluminium foil with two layers of calcium silicate panels
- parquet flooring’

Energy production is separated from energy consumption by using thermal storage. This results in smaller installed capacities, lower investments, fewer variable operations, less wear and tear and less maintenance. ‘An energy reduction of 50 per cent is possible in the built environment. Additionally, PCM panels are fully modular and detachable, so that materials can in principle be used “for ever”.’

Using PCM panels is not new: they have been used previously in the ABN AMRO offices in Alkmaar and The Hague. The unique aspect is the set-up of the floor package for the pavilion. According to Gouw, the biggest challenge is ‘to make sure that all parties become familiar with the possibilities and the functionality of PCM panels’.



More CIRCL examples of lifetime extension

The architecture of Circl focuses on lifetime extension in other respects too, in both the interior and the exterior. For example, the building has a considerable amount of free space at the top that can serve multiple purposes and has maximum detachability. We did not always choose the cheapest option because we apply the life-cycle costing approach. This can be seen, for instance, in the high-grade, very Dutch [Exasun](#) solar panels, which are guaranteed to be highly efficient for longer. Or in the modular, adaptive [Donkergroen](#) planters. The wooden shell is detachable and oversized, and the [Oranjedak](#) roofing has been installed in a detachable way on the wooden shell.

Lifetime extension outside CIRCL

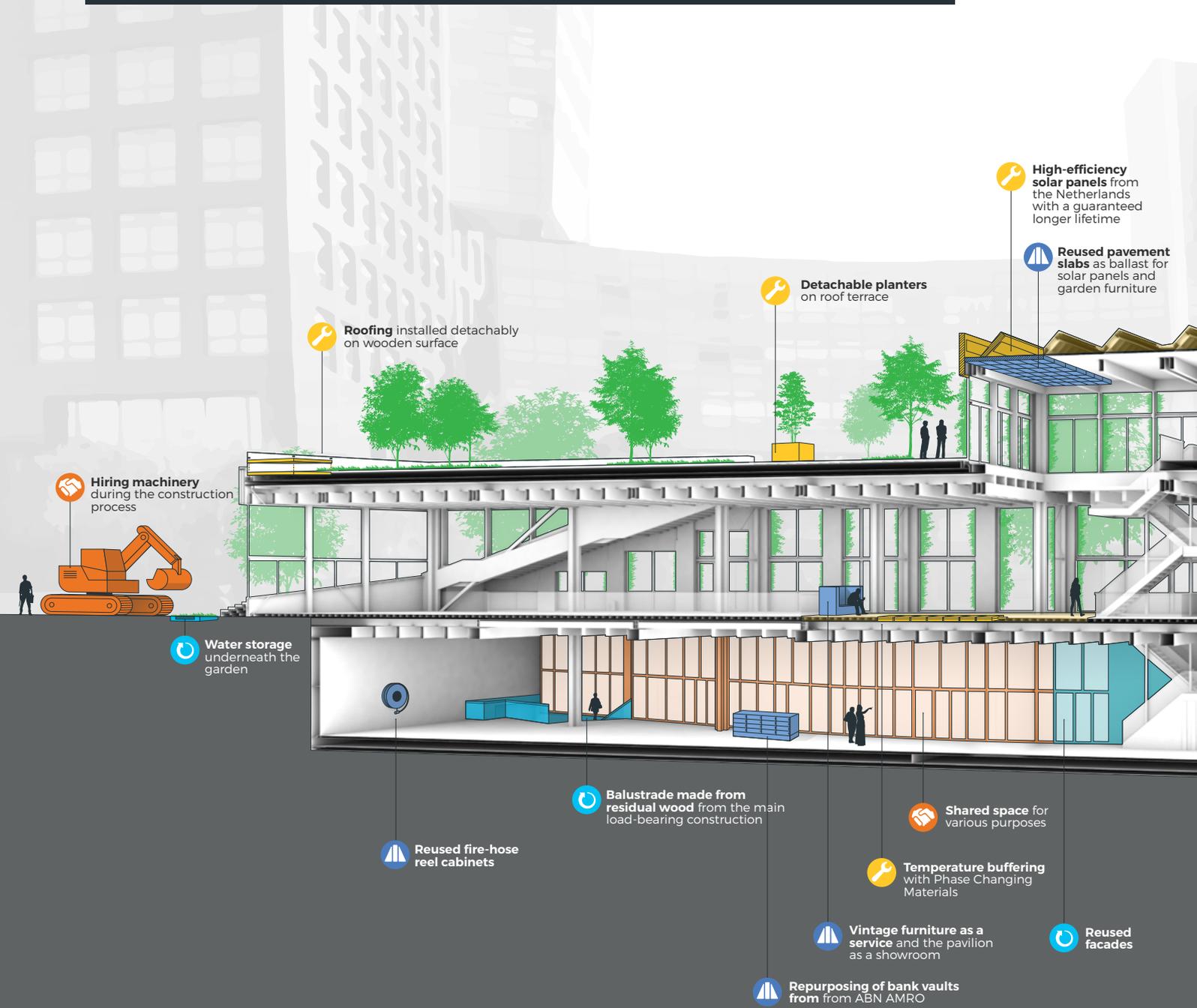
- Overhauled climate systems ([OC Verhulst](#))
- Remanufacturing of electric motors ([ACE Reuse Technology](#))
- IoT monitoring of construction assets ([IBM](#))
- Self-healing concrete ([TU Delft](#))
- Smart reconditioning of metal ([Adapt Laser](#))
- Design for disassembly ([Park 20|20](#))
- Modular design ([Seed Architects](#), see case study of Martini hospital [CSTC](#))
- Modular buildings ([Finch Buildings](#), see case study [Platform 31](#); [Ursem](#))

CIRCL: 'LIVING LAB' FOR A CIRCULAR BUILT ENVIRONMENT

Circular business models were used as much as possible for the construction and operation of Circl. This visual gives an overview of some engaging examples. The enabling factors of the circular economy (see right) were used for the development and application of these business models.

During the pavilion's operation, it will continue to be used as an experimental space for companies and the community in order to put circularity into practice. This is not about copyright but about the 'right to copy'.

-  **CIRCULAR DESIGN** of the building and the interior, e.g. by using detachable components, reversible connections, prefab elements and energy simulations.
-  **DIGITAL TECHNOLOGIES** such as BIM, robot architecture, material passports, building passports, smart building technology, IoT and a digital marketplace for building materials.
-  **NEW FORMS OF COOPERATION** e.g. by involving internal and external stakeholders during the development, by using performance-oriented purchasing during construction, and by the circular operation of the catering facility.



 **Hiring machinery** during the construction process

 **Roofing** installed detachably on wooden surface

 **Detachable planters** on roof terrace

 **High-efficiency solar panels** from the Netherlands with a guaranteed longer lifetime

 **Reused pavement slabs** as ballast for solar panels and garden furniture

 **Water storage** underneath the garden

 **Balustrade made from residual wood** from the main load-bearing construction

 **Reused fire-hose reel cabinets**

 **Shared space** for various purposes

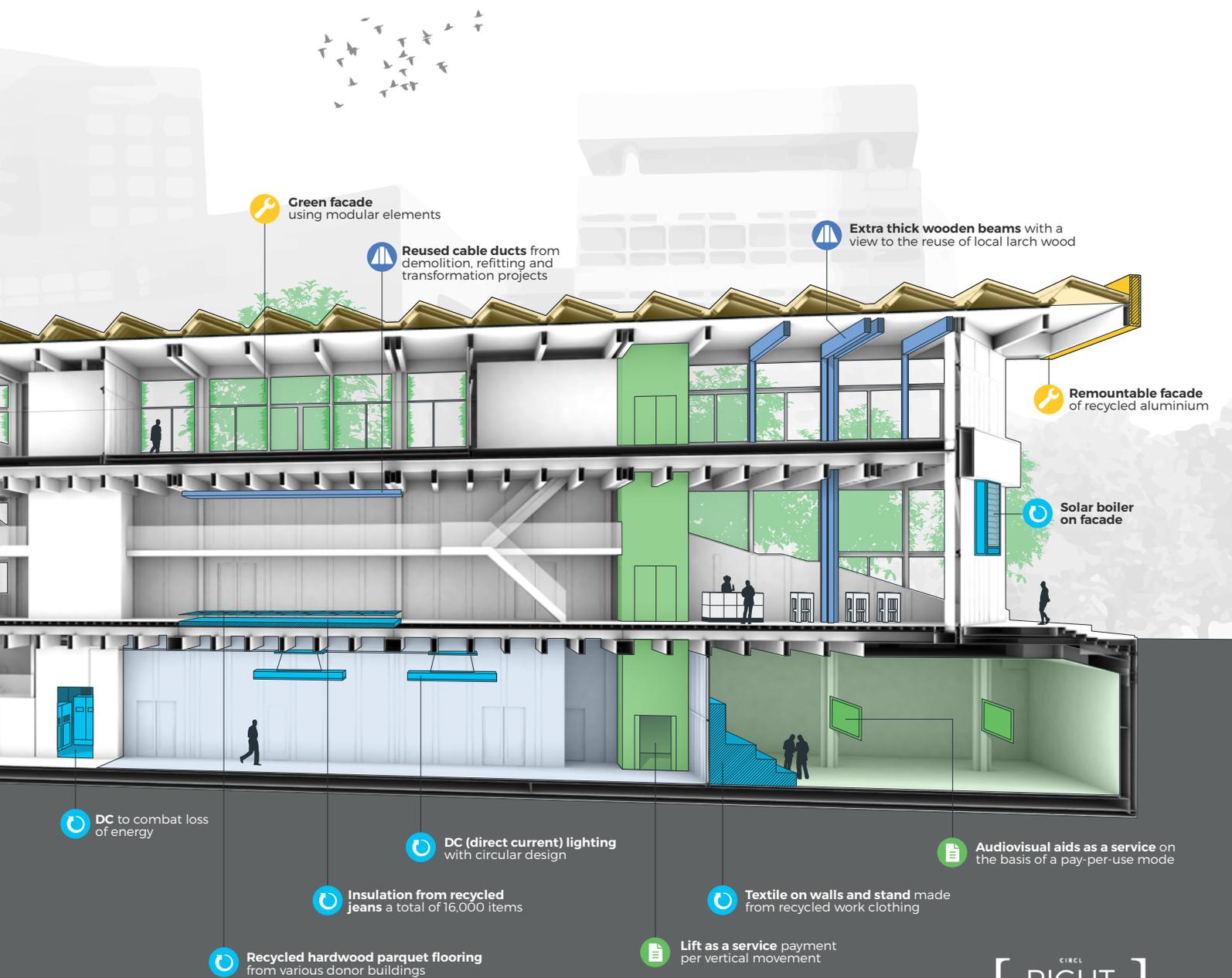
 **Temperature buffering** with Phase Changing Materials

 **Vintage furniture** as a service and the pavilion as a showroom

 **Reused facades**

 **Repurposing of bank vaults** from ABN AMRO

-  **Circular inputs**
-  **Product-service systems**
-  **Lifetime extension**
-  **Sharing platforms**
-  **Value recovery**



CIRCL
RIGHT TO COPY



SHARING PLATFORMS

There is a strong shift from ownership to use among millennials, and then only using something when it is needed. Sharing platforms also provide an answer to the increasing lack of space in major cities. This applies to cars (parking), but the area available for living and storing things is also becoming more scarce. Start-ups and companies with a business model that enables a more efficient use of assets are appearing everywhere. Increasingly, consumers are seeing opportunities to benefit financially from the modern sharing economy. ⁴¹

This sharing economy owes its existence to techniques that are continuously being improved (online platforms linked to apps) and to the rapidly increasing availability of useful data. Originally, sharing platforms focused on the optimum use of unused or underused assets. Examples are cars via Blablacar, homes via Airbnb and 'stuff' (mainly tools) via Peerby. They are now increasingly being used to market new assets such as cars via Greenwheels and Snappcar ⁴² - and Tesla in the future. ⁴³

Sharing platforms are also used in the construction sector, for example for machines and equipment. FLOW2 lets you share assets – including staff – among departments of the same company as well as among companies. ⁴⁴ In the operational phase, other platforms make it possible to optimise the value of a building. They too make use of the sharing principle. Examples are workspaces, parking spaces, apartments, hotel bedrooms, rooms ⁴⁵ and even sports areas. ⁴⁶

Financial solutions

Financing sharing platforms is becoming more and more common, and structuring such financing is often straightforward. An important feature of this business model is the degree of certainty about the expected income. Capital-intensive assets are used in many cases to ensure remuneration from the user, for example, a workplace that covers part of a building, including furniture and cabling. The guaranteed occupancy rate of this workplace is important for financing.

New value

- Access, performance and/or experience create the additional value
- Increased use: higher utilisation rate; fewer new products created; environmental benefit and more space
- The latest technology is applied more quickly
- Relatively low investments and capital requirements needed
- Confidence through review systems creates value

Challenges

- Utilisation rate of the asset
- High level of disruption because of low barriers to entry
- Effect of the right of pledge on movable current assets such as construction machinery; makes it difficult for the bank to convert into cash in practice
- Legal obstacles in the platform-user relationship
- Insuring assets (if assets are used increasingly by anonymous users)



Malu Hilverink

Programme manager
of CIRCL, ABN AMRO

*“At Circl
we don’t
talk about
copyright, we
prefer a ‘right
to copy.’”*

Platform for knowledge sharing, a meeting space and living lab

Circl is a sharing platform for all kinds of assets, such as workspaces and meeting places. It is also a place for debates, where knowledge is shared. Circl is open not only to the employees and customers of ABN AMRO and other users, but also to people living in the Zuidas and everyone who is interested in the circular economy.

Malu: ‘The pavilion looks like a static building, but in reality it’s a “living laboratory” that offers room for change. It’s where we test all kinds of sustainable solutions: from the hospitality sector to the anti-sun facade by Fasolar, a Dutch company that generates thermal energy. We are also experimenting with a circular-economy pop-up shop, exhibitions and various activities such as workshops and lectures. This makes the building a flexible platform for developing the ideas, concepts and strategies of the future. The knowledge that we gain is shared with clients and visitors, but also with other banks, as they all have a “right to copy”:

Circl’s layout is also a circular-economy experiment. The art and some of the furniture come from ABN AMRO’s own collection (both written-off furniture and historical archives). Furthermore, there are tables and chairs made from recycled materials, as well as furniture from Mass Modern Design. This company supplies the furniture as a service, but items are also for sale. By sharing Circl’s space, Mass Modern Design saves on storage space and shop space thanks to this new ‘showroom’.

‘We want to roll out this circular-economy philosophy further within the organisation. Facility Management, for instance, is looking at possibilities to change the traditional ABN AMRO bank shop into a bank shop 3.0, in which circularity is a central theme. We will then make use of our own stocks and apply the knowledge and experience we have gained.’



More CIRCL examples of sharing platforms

Heavy equipment was hired during construction ([Boels](#)). Spaces will be hired out and workplaces offered after completion of the construction, and the restaurant will be open to both employees and the general public. Besides food, knowledge will be shared too, for example through the collaboration with [Pakhuis de Zwijger](#). We will also consider alternative sources of income, which does not necessarily have to take the form of money. The sharing platform is also suitable for barter trade, for example.

Sharing platforms outside CIRCL

Sharing platforms during construction:

- Tools, services and people ([Flow2](#))
- Machinery ([EquipmentShare](#), [Dozr](#), [Getable](#), [Klickrent](#))
- Knowledge ([BAMB](#), [Buildings as Material Banks](#))

During operation:

- Unused parking areas of office buildings ([ParkBee](#)) and private individuals ([MobyPark](#))
- Home office spaces ([DeskToday](#)) and shared workplaces (numerous examples)
- Storage areas with private individuals ([Storage Share](#))
- Property used alternately for student accommodation and as a hotel ([The Student Hotel](#))

All things come to an end, and that goes for buildings too. The high-quality reuse of products, components and raw materials is almost always possible. However, this is often an intensive and complex process for existing buildings. The demolition phase should, therefore, be taken into account in the initial tender. This can be done by extending the DBFMO model* to add a sixth phase: *Deconstruction* (DBFMO-D). Today, there are innovative methods to involve the entire supply chain in requests for tenders, with 'Rapid Circular Contracting' as an example.⁴⁷

The circular economy not only looks at the cash flow (rent) and the location of buildings, but also considers buildings as raw material banks.⁴⁸ The value of real estate is currently linked mainly to the price of the location and the difference between rental income and operating costs. Often, the value of the raw materials in the building is of secondary importance. This view will change fundamentally in the transition from a linear to a circular economy. However, in business models, demolition is often still more profitable than dismantling.

Cooperation is essential to close the construction loop. Partners are therefore required both inside and outside the sector. It is the only way to step out of the traditional vertical construction column and jointly create a construction circle. Regulations will undoubtedly help achieve this. Any governmental obligation to use circular inputs will create a shortage in 'second-hand' products, cause prices to increase and make recovery profitable. We see a parallel with how sustainability is handled, but the circular economy is developing faster.

Financial solutions

At the end of the product cycle, residual products are created that still seem worthless now but can actually be valuable in a circular economy. But what exactly is this value and who is going to guarantee it? Traditional business models are turned completely upside down by this. As a company, you have to spot and use opportunities by linking inputs to outputs.

There are currently numerous initiatives that are enabling high-value recycling ('upcycling'), a core component for the circular economy. However, these solutions are often extremely innovative and require the use of new (almost unproven) technology. Banks

attach importance to clients contributing capital and to long-term contracts with customers when granting loans or guarantees.

At the start of a product cycle, sector partners and banks have to allow more for higher investment costs, which justify lower running costs and a higher final value of the building elements. This therefore means a relatively higher loan-to-value ratio for a project, and a relatively smaller amount of equity capital relative to the loan capital. This is something that we at ABN AMRO are experimenting with, for instance when making real estate more sustainable.

More (hybrid) financing products can further facilitate the financing. These could be equity, risk funds or other forms of financing besides bank financing.

New value

- Residual value of products that will be sufficient to start a new construction cycle
- Being prepared for a shortage of raw materials. New policy/regulations to meet the objectives of the government-wide programme
- Lower transport costs (use what is already there, if possible on site)
- No costs for waste removal; instead, revenue for new raw materials

Challenges

- The residual value of products and materials is difficult to determine
- Innovations – technical and social – are required to utilise residual value
- Competition from virgin materials; not a level playing field for circular materials
- The scale and the number of demolition products determine the volume and price; the financing of purchase contracts is based on this
- Quality differences and uncertainty concerning the specifications
- Dependency on sector partners

* DBFMO = Design - Build - Finance - Maintain - Operate



“Material passports will be key to accelerating the circular economy.”

Johan-Paul Borreman

Sales and project management,
Derix Holzbau

Wooden load-bearing structure ready for a second life

We chose Dutch larch wood from the wood processing and production company Derix for the main load-bearing structure of the pavilion. We made this choice because of the biomass and ‘the feel’.

Johan-Paul: ‘We intentionally used larger dimensions for the components of the wooden structure than were required from a structural design perspective. This makes it possible to reuse the wooden components, after planing them if necessary, in the same span in a subsequent building, perhaps based on different loads, if the pavilion is dismantled. The decision to use larch wood is motivated not by the cost but by the sustainability and circularity aspects. It is stable in value and can be used more easily at the end of its service life, unlike other, cheaper types of wood like pinewood.’

Wood is not only an appealing and well-known product, it is also a renewable organic product and therefore a material resource that will in principle not become depleted, provided it is certified wood like the Dutch larch wood. That is why we used as much wood as possible for the construction of Circl. Besides the laminated girders, Derix also supplied the cross-laminated wooden wall and floor elements, lift shafts and wooden staircases. ‘We chose local Dutch wood, which reduces the transport and the CO₂ emissions. We did not use foil either for the temporary protection of the wood. Any dirtying of the wood has been made secondary to the circular-economy idea.’

Designing for reuse also requires different kinds of connections. For Circl, we mainly used self-drilling screws. This is because connections that damage the wood make successful reuse impossible. According to Johan-Paul, self-drilling screws are not yet innovative enough, but there was little room for innovation because of the lack of time.

‘Being open to innovation and being able and willing to think ahead is essential to success in the circular economy. A lot of market players and colleagues didn’t understand why we kept the residual wood. After all, this adds to the transport costs.’

‘Be inspired by other parties that are already working on circularity, and be transparent and share knowledge. Databases will be important in speeding up the circular economy. This makes ‘urban mining’ possible. This also affects the role that Derix may play in the construction chain. One possibility is a role as a supplier of raw materials and advisor, rather than just a producer of semi-finished products.’



More CIRCL examples of value recovery

The residual wood from the main load-bearing construction was used for the permanent interior (Vermaat). The cable ducts are from another property (Rexel, New Horizon). Pavement slabs from the old forecourt have been used as ballast for the solar panels (BAM, Donkergroen) and garden furniture (Donkergroen). Natural stone was reused for the edge finishing on the planters (BAM). The filling material (EPS) for the garden (Donkergroen) and the slabs for the pavement have been reused (Donkergroen, Stonetrack).

Value recovery outside CIRCL

- Online marketplaces for reused or recycled building materials (CirMar, Oogstkaart, Excess Material Exchange, Circle Market (textiles))
- High-quality recycling concrete (Smart Crusher/SlimBreken)
- Buildings as material banks (Arup and partners, RAU architecten)

3. MARKET POTENTIAL FOR CIRCULAR DEVELOPMENT AND CONSTRUCTION

The importance of circular construction becomes crystal clear if we look at the volume of primary raw materials that the sector needs, as does the market potential. The question to ask, therefore, is how big this market is, and whether the national targets for circular construction are achievable - we still have a lot to do before circular construction becomes a reality on such a large scale.

As stated earlier, the Dutch Government has drawn up the government-wide programme entitled 'A circular economy in the Netherlands by 2050'. The construction sector is one of the priorities in this programme focusing on reusing more materials in residential and non-residential buildings. Only 3-4 per cent of the materials in residential and non-residential buildings are currently given a second life. Progress in civil engineering projects demonstrates that there is room for improvement: where an estimated 50 per cent of the materials are recycled. A large part of the materials from residential and non-residential buildings still end up as rubble underneath roads or in biomass plants. We can do better.

Ambition with challenges

The National Government wants the Dutch economy to run fully on reusable raw materials by 2050. We are supposed to be halfway there by 2030. Imagine: half of every building will consist of 'second-hand' recycled products. However, meeting these goals will be a big challenge for multiple reasons. Firstly, the quantity of material that we are using and have available now is enormous. Compounding on this is the fact that the construction sector is expected to continue to grow, and with it, further raw material use. Ultimately, this emphasises why the sector has to shift to new forms of partnership, yet also presents an enormous task for innovation.

Let us make a simple calculation: on average 17,000 buildings were demolished each year over the past five years (11,800 houses and 5,200 non-residential buildings). In that same period 57,000 new buildings were constructed each year (49,000 houses and 8,000 non-residential buildings). A difference of 40,000 buildings. Historically speaking, the situation is even more unbalanced: between 1921 and now, an average of 76,000 houses were built and 8,500 houses demolished each year; a difference of 68,500 buildings.⁴⁹

This means that we can build a maximum of 17,000 houses each year using fully recycled materials, and this is without even taking the size of the buildings into account. Illustratively, this represents about 30 per cent of newly built houses and non-residential buildings in

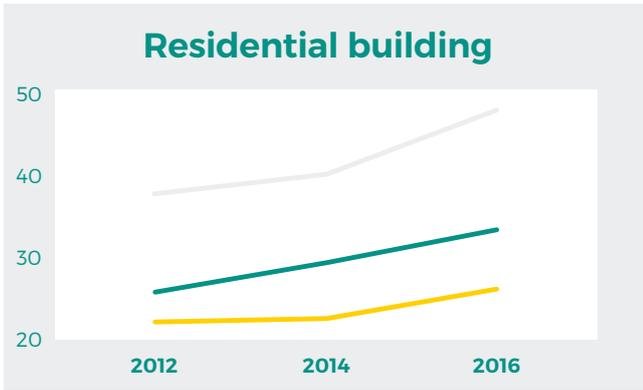
recent years. This more or less corresponds to an average of around 60 million tons of materials that is used on an annual basis for construction (excluding infill sand). At the same time, around 20 million tons of construction and demolition waste are released (excluding asphalt). Construction and demolition waste is becoming scarce and therefore more valuable. With a shortage of the circular inputs, how are we going to meet the target of 50 per cent circularity by 2030?⁵⁰

How can we make it add up?

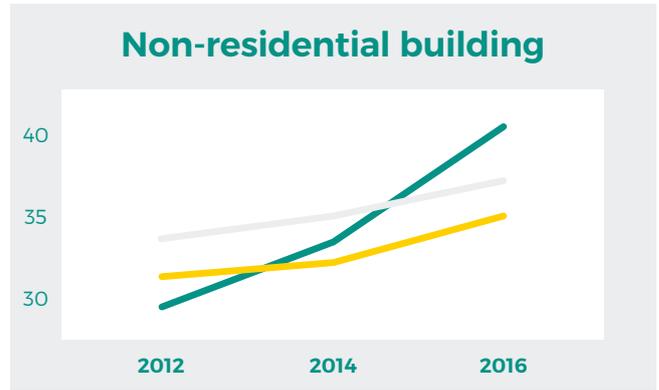
According to Government directives, the remaining materials to be used in new buildings must come from biomass, for example wood. The Netherlands produces relatively little wood, so we import a large part of it. Wood is still used to a limited extent: it represents around 4 per cent of the building materials that we use in buildings, about 2.5 million tons each year. Most of the building materials used consist of sand and gravel. It should be realised that wood production is increasing at a slower pace than the production of other building materials, and a significant increase in this current trajectory is therefore not to be expected. Therefore, in order to use more wood, we have to import more wood. Yet importing wood to the Netherlands generates emissions. This perfectly illustrates how complex the matter is.

Based on the current use of raw materials for new buildings (60 million tons), measures are required in order to meet the first goal in 2030 of 50 per cent less primary raw materials (a decrease of 30 million tons):

1. Maximum reuse of construction and demolition waste (20 million tons)
2. Increased use of biomass (wood)
3. Waste reduction in construction processes (packaging, failure costs)
4. Lifetime extension (more robust, modular, repairs and transformation)
5. Sharing platforms (handling the existing stock more efficiently)
6. Designing more efficiently (lighter in weight, using different materials)
7. Less use of finishing materials
8. Life-cycle costing (TCO etc.) when weighing options rather than looking at construction costs only
9. More innovation on all fronts (e.g. materials, Big Data, calculation models and BIM)
10. Less built space per person in all functions (homes, offices, storage etc.)



● New buildings ● Minor maintenance ● Major maintenance



Share of installation work in residential and non-residential building is increasing (source: Uneto-VNI)

It is not only the construction companies and clients that play a role in making this all possible, the government has an important task too. The transition faces a number of challenges for which new regulations may provide a solution. For example, the government can stimulate the use of 'second-hand' products (for example in the buildings aesthetics committee and when issuing permits); steer things in the right direction when setting requirements (the percentage of circular inputs in new buildings); while legal (property-law) and tax (VAT) obstacles have to be resolved. In order to meet these ambitious goals, all stakeholders have to act together.

Less is more

At the same time, approximately 68,000 to 80,000 new houses will be required⁵¹ each year in order to meet the growing number of households - whereas an average of 49,000 houses were built in recent years. An increasing quantity of new buildings, and a continuing rise in prosperity, will present a significant challenge to achieve the government's circular directives.

The 2030 goal can be met. But even more progress is required to ensure full use of **circular inputs** by 2050. The cooperation, innovation and regulations needed for this must take place now.

It is not just about new buildings

Circular construction is about more than just new buildings and the building itself; it involves paying increasing attention to usage rather than purchasing. With **product-service systems** for instance, you only pay for the use of a lift and you therefore do not have to buy it. UNETO-VNI, the sector association for installation companies, has calculated the installation share for buildings:⁵² the share of installation work in the overall building costs. The installation share is high in housing and non-residential building and has also increased considerably in recent years (see the graphs above). This proportion is around 30 to 40 per cent for new buildings, and between 26 per cent and 48 per cent for renovations. Based on the production of buildings in 2016⁵³, installation systems cost about €12 billion (including their assembly).

These figures indicate just how significant the market for product-service systems can be. Moreover, this will help to **extend the lifetime** of products: if a product remains the property of the manufacturer, that manufacturer will do anything to give it the longest lifetime possible. Yet, even if the life of the product has ended, this does not have to be a problem: of the bulbs that were removed from buildings, 85 per cent were recycled, as were 75 per cent of air conditioners and 73 per cent of electrical components.⁵⁴

Sharing platforms can ensure that buildings are used in a different way. The best example of a platform that has considerably boosted the efficiency of real estate is, without doubt, Airbnb. Although IT played a leading role in the more efficient use of real estate, cultural changes are important too. We can also use office space better, for example, if we change our working hours. In the long run, technical developments and cultural changes will mean less need for new offices, while the efficiency of existing offices will increase. This development with fewer new buildings combined with lifetime extension will not be limited to office buildings.

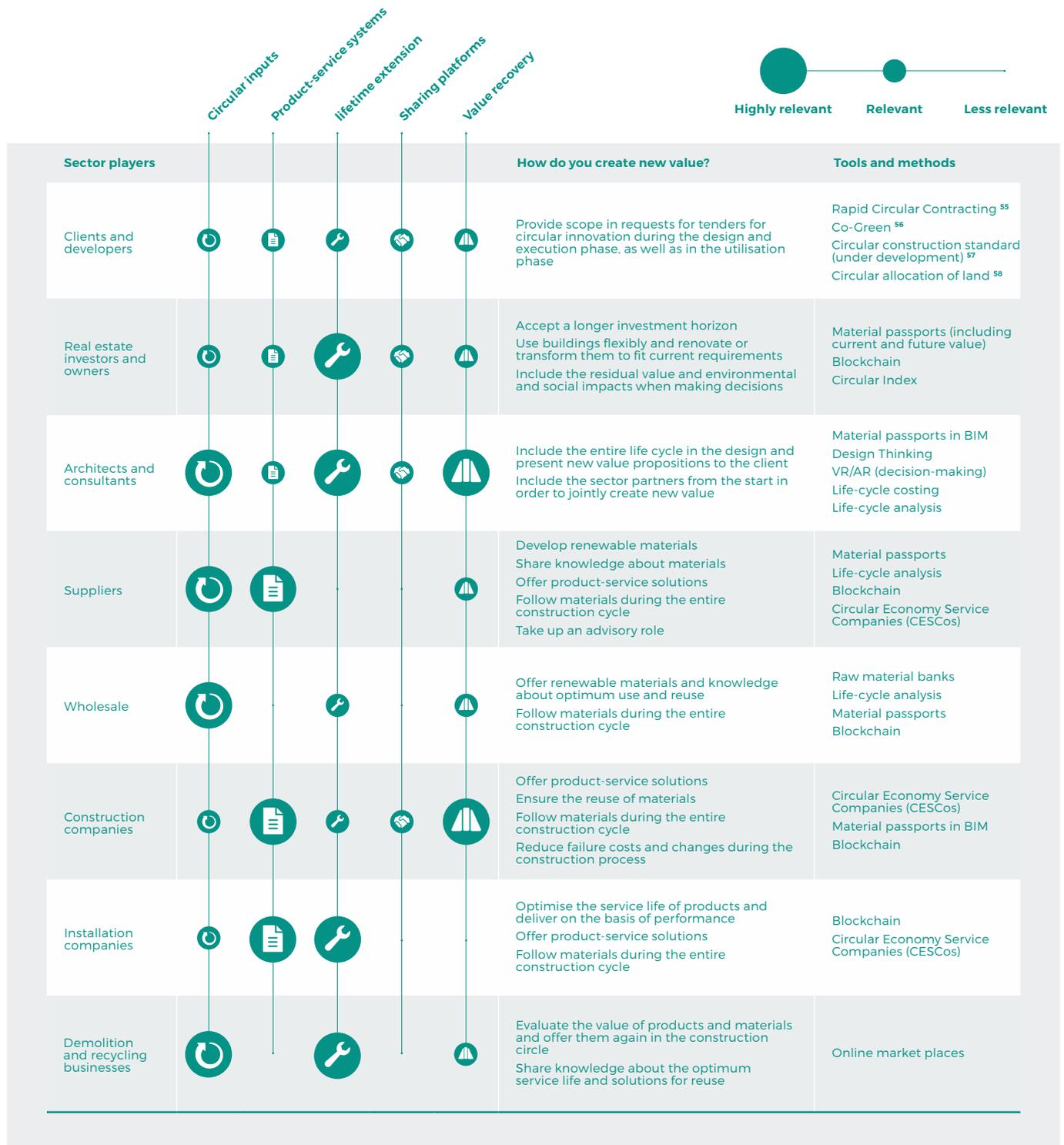
Not all circular business models have the same potential. In the table below, we indicate the potential market for each business model.

| Market potential | |
|---------------------------|-----------|
| Business model | Potential |
| 🔄 Circular inputs | ●●●●● |
| 📄 Product-service systems | ●●● |
| 🔧 Lifetime extension | ●●● |
| 👥 Sharing platforms | ● |
| 🏠 Value recovery | ●● |

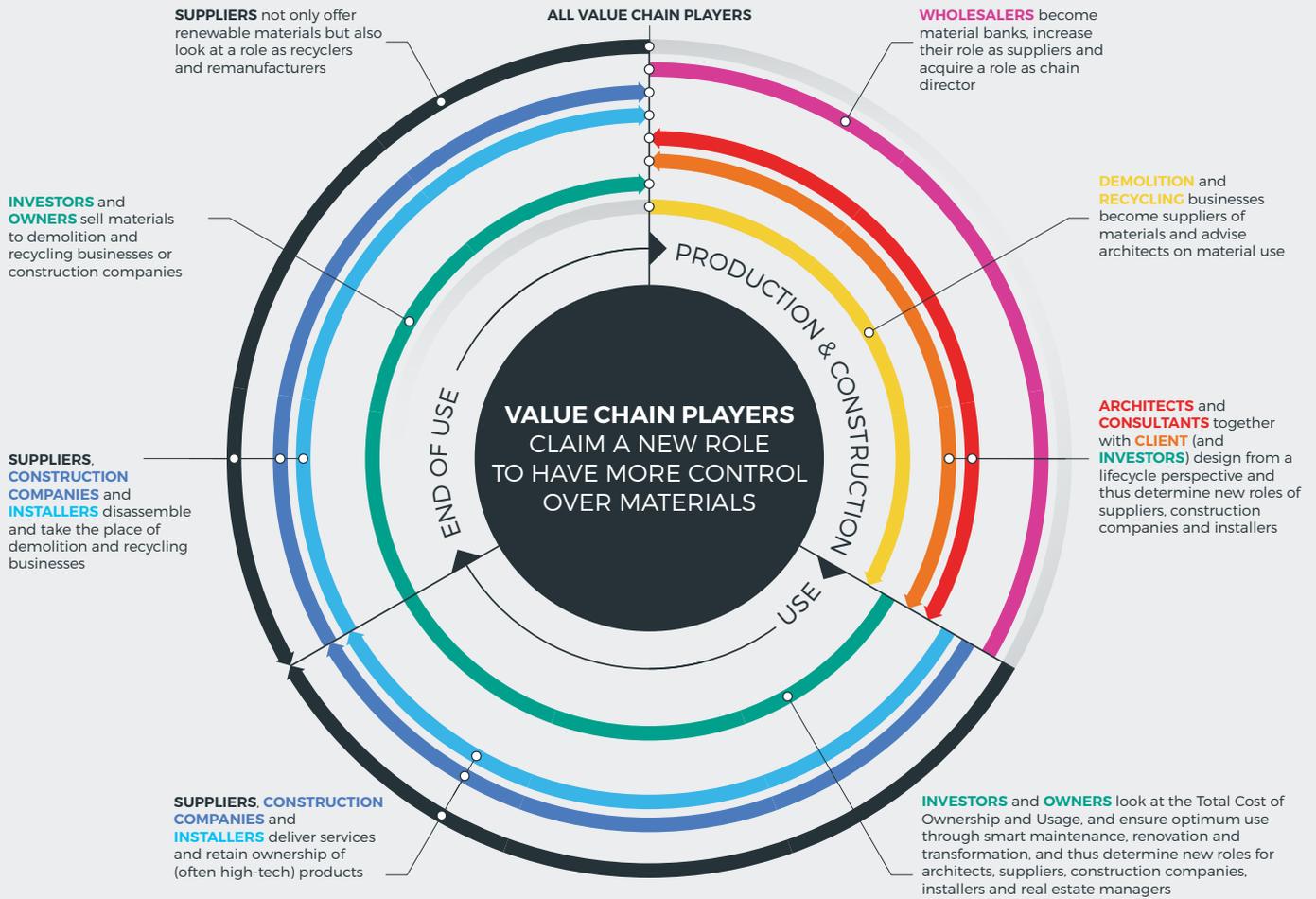
4. NEW OPPORTUNITIES IN THE 'CONSTRUCTION CIRCLE'

The current construction and real estate process is not only highly fragmented but also follows a long, linear chain. For the circular economy to work, this linear approach has to change. Sector partners can seize far more opportunities by adding value at different points in the process, entering into new partnerships and investigating different business models. That is difficult in the context of current working methods and mindsets.

In the figure below, we indicate which circular-economy business models provide opportunities for various sector players, and how these can be used to create new value. Additionally, we also mention a few innovative tools and methods that can be used to implement new business models.



Parties can change their role in the sector by looking at new partnerships and business models. The end of the property cycle eventually becomes the start of a new construction cycle. This changes the vertical construction column into a 'construction circle'. And this is how the circular economy starts to take shape.



Building a new role

Companies and organisations who operate in the Construction & Real Estate sector must determine what role they want to play in the construction circle. Doing nothing is not an option; doing something is easier than you think. The above figure shows how the construction circle takes shape if sector players adopt new roles that give them more of an overview and more control over products and materials. Investors and developers work on the basis of a long-term horizon, total cost of ownership and other ways to value real estate. The activities of demolition and recycling businesses, for instance, shift towards the suppliers, whereas construction companies and installation businesses demand a bigger role in the utilisation phase and when dismantling buildings; they might retain ownership of products and assets in the new situation. This is how players in the construction industry can raise the value of materials, which will also often let them improve their financial performance. What is more, this has a favourable effect on material savings and emission reduction.

New players in the market

Besides a changing role for traditional players, there are also new innovative parties that can acquire a position in the construction circle. Innovation will come from SMEs, which can act faster and are more agile. But larger companies from other sectors (Ikea, Amazon) also have their eye on a place in the construction circle. And technology companies also play an important role. They will create solutions for 3D printing, circular-economy valuation, real-time pricing and online platforms, for instance. Companies that have not yet played a decisive role are expected to develop services that affect the ownership of materials in the construction industry. Energy suppliers, for instance, could become co-owners of climate systems, and logistics parties may be interested in setting up raw material banks. The race for building materials and raw materials has started.

5. KEEPING THE BALL ROLLING - TOGETHER

We are on the eve of a big transition to a circular economy. We at ABN AMRO have made progress and learned lessons, and we see that more and more companies are seizing the new opportunities. The start can be very small, even for large companies. We have produced this report because we want to show what we have learned – giving you the ‘right to copy’ – and where the opportunities in the Construction & Real Estate sector lie. Circl is our first and most visible skills test, but we have since progressed somewhat further still as a bank. That is because the circular economy offers so many more possibilities.

New steps

Together with our partners, ABN AMRO has developed a material passport (LLMNT)⁵⁹, which is linked to BIM and a database. It was set up for Circl, but it can also be used for our other buildings. In this way we are creating a materials database of our own, so that we know what we have, what it has cost, who the owner is, and who can do something with it and when. Materials can always be traced and buildings can be used as raw material banks in the future. We have designed Circl with disassembly in mind, so all elements can be dismantled and reused simply and at low cost, which is fully in line with the Madaster philosophy⁶⁰ (ABN AMRO is an ‘early’ Kennedy at Madaster).

Circular operations

Now that the building has been delivered, a new phase starts for Circl and for us too. During the operation and management, we will continue to experiment with innovative circular solutions in our ‘living lab’. In addition to paying attention to the optimum use of materials, we will also look at other values that we can generate with Circl. We are increasing our social capital with a meeting place for our clients and partners, a link with the neighbourhood and liveable surroundings in the city of Amsterdam. At the same time, we are building on our natural capital by ensuring a green, biodiverse environment in and around the building, which will, for instance, be given a water purification function in future. Finally, we are making our financial capital more sustainable by investing in the circular economy.

Moving on with clients and partners

We are working with clients and partners that want to accelerate the circular transition in Construction & Real Estate. We help them with customised financial products, new knowledge, a network of active clients and partners, and a big ambition to implement the circular economy. As an example, ABN AMRO and IBM are jointly investigating whether we can make the construction supply chain transparent and trace raw materials using blockchains.⁶¹ ABN AMRO is also using its practical experience to help develop ‘HAUT’, a circular wooden high-rise development in Amsterdam.⁶² We want to keep the ball rolling - together.

Achieving a circular business model in four steps

The message to every entrepreneur is: *‘rethink’*. Look at what you can already do and get started. Some simple steps that a company can use to get started are:

- 1 Determine which **role** you want to play in the construction circle.
- 2 Determine which (new) **business model** fits.
- 3 Start consultations with (new) sector players to **flesh out** the business model.
- 4 Show **leadership** and get started.

A detailed step-by-step plan for setting up product-service systems has already been developed in cooperation with Circle Economy and Sustainable Finance Lab.⁶³



Sustainable Finance Desk

The Sustainable Finance Desk at ABN AMRO helps clients and partners explore circular business models. We use three guiding principles for this:

- 1** We are open to new ideas, technologies and business models, and take the time to understand these properly. We want to understand the entire supply chain and will look for the strongest players in financial terms; they can help increase financing.
- 2** We play a role as a connecting party. Sometimes we cannot be the only source of financing. To make sure that a company can continue to develop, we actively look for partnerships with other investors or finance providers.
- 3** We aim for maximum transparency. This lets us find out as much as possible about the businesspeople and their company. We also involve businesspeople in our decisions and underlying motives.

Financing the circular economy is a question of customisation, in which we immerse ourselves in companies and their need for financing on a case-by-case basis; and sit down with them to discuss various matters. Our door is always open for a good proposition that will further the transition to a circular economy.

Your company and the circular economy

If you have a company that is engaged in the circular economy, if you wish to invest in more sustainable operations and you need financing, we would be happy to discuss this with you.



Hein Brekelmans

Head of the Sustainable Finance Desk, ABN AMRO
hein.brekelmans@nl.abnamro.com
06 - 16 01 40 00

WHAT IS ON THE PROGRAMME?

Room for everyone

Circl is the name of the new circular hotspot and meeting place in the Zuidas district. Circl has a meeting centre, restaurant and rooftop bar. You can come to Circl to work, have drinks or eat, meet other people or listen to a lecture. Circl is open to all and it offers a varied and inspiring programme in partnership with Pakhuis de Zwijger. Social and economic issues take centre stage, including new opportunities and solutions for the circular economy. You will find **agenda of Circl** on the website.



Circl is an initiative by ABN AMRO, but it is certainly not exclusively for ABN AMRO. Anyone can organise an event in Circl. We have a lovely large area for events on the ground floor and meeting rooms in The Basement. We invite you to pay a visit to Circl. To reserve rooms in The Basement meeting area, please contact the Events Desk FM on +31 (0)20 343 33 03. You can find more information about the events on the Circl website: <https://circl.nl>

Working together on circular innovations

In the **ABN AMRO Innovation Centre** we focus on innovation in the long term. We consider possible future situations and look at whether we can play a role there. And if so, what kind of role. We also teach colleagues outside the Innovation Centre various techniques and methods that will help them innovate. In this way, we build bridges between innovative parties and make maximum use of our own innovative potential.

Digitisation and the circular economy are important themes in our Innovation Centre. For example, we are working on the 'LLMNT' material passport in partnership with Architekten Cie, CAD & Company and Rendemint using various blockchains. Torch is one of our blockchain initiatives that has been worked out in detail for the Construction & Real Estate sector.

Business design workshops

At the Circl Action Hub, we organise business design workshops with and for our clients and partners. The aim of the workshops is to find out and specify what impact the new business models have in the circular economy. We contribute our knowledge of the sector, financial expertise and network, and are keen to join up with clients and partners. If you are interested, keep an eye on the agenda at **agenda van Circl** or contact us.

Circular brands

How can your brands and brand experience contribute to a more effective circular business model? And how can you get users involved in your circular product strategy? We discuss these and other questions in the circular brand workshops of Circle Economy and partners. The programme is aimed at the creative industry, the leading lights amongst 'brand developers', marketers and the drivers of the circular economy in a company. ABN AMRO is supporting these developments because they contribute to better business models. If you are interested, please contact simone@circle-economy.com

ABOUT THIS REPORT

This report was compiled by Circle Economy and ABN AMRO.

About Circle Economy

A social enterprise, we accelerate the transition to circularity through the development of practical and scalable solutions. Our tools and programmes are designed to facilitate decision-making and action plans for businesses and governments in a wide range of sectors.

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Best practices & case studies

The examples given of circular business models outside Circl can be found in the Circle Economy Knowledge Hub (knowledge.circle-economy.com).

References

The number references are available via hyperlinks in the PDF version of this report.

Distribution

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A FUTURE PROOF BUILT ENVIRONMENT

Putting circular business models into practice

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